User Manual

P Line Maritim HMI

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE
This symbol together with the signal word NOTE and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.

This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

1.2 Safety Notes

- Read this manual carefully before using the operating device. Keep this manual in a place where it is always accessible to all users.
- Proper transportation, handling and storage, placement and installation of this product are prerequisites for its subsequent flawless and safe operation.
- This user manual contains the most important information for the safe operation of the device.
- The user manual, in particular the safety notes, must be observed by all personnel working with the device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3 Intended Use

- The device is designed for use in maritime areas.
- The device is state-of-the art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.

– The device fulfills the requirements of the EMC directives and harmonized European standards. Any modifications to the system can influence the EMC behavior.

NOTICE: Radio Interference
This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate countermeasures, and to bear the cost of same.

1.4 Target Group

The use of products described in this manual is oriented exclusively to:

– Qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.
– Qualified application programmers and software engineers, who are familiar with the safety concepts of automation technology and applicable standards.

2 Installation and Commissioning

2.1 Unpacking the Device

Unpack all parts carefully and check the contents for any visible damage in transit. Also check whether the shipment matches the specifications on your delivery note.

If you notice damages in transit or discrepancies, please contact us immediately.

2.2 Mounting the Device

DANGER
The following safety distances to a compass must be kept depending on the display size of the operating device:

	Display <= 7"	Display > 7"
Standard compass	0.75 m (29.527")	2.2 m (86.614")
Steering compass	0.45 m (17.716")	1.35 m (53.149")

NOTICE: Damage
When installing the device, leave a gap of at least 30 mm (1.181") around the device to ensure sufficient air circulation.

NOTICE: Damage
When the operating device is installed horizontally, please note that additional sources of heat beneath the operating device may result in heat accumulation. Make sure to allow sufficient heat dissipation!
Please observe the permissible temperature range specified in the technical data of the user manual when operating the device.

NOTICE: Damage
In order to ensure the degree of protection specified in the technical data, always make sure that the seal lies flat against the mounting surface and the threaded pins of the mounting brackets are tightened uniformly to a maximum torque of 1 Nm.

The device can be easily and quickly mounted from the rear of the device. A panel thickness of 1 mm to 6 mm (0.039" to 0.236") is permitted for proper mounting.

1. Insert the device in the mounting cutout from the front.

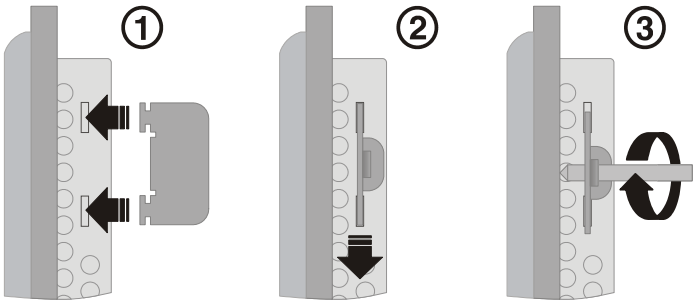


Figure 2-1 Mounting the device using a mounting bracket

2. Insert the mounting brackets into the appropriate openings (1) and pull the brackets downwards until they lock in place (2).
3. Fasten the device into position using the threaded pins (3).

2.2.1 Front Panel Dimensions

2.2.1.1 TPM070ZTW

Figure 2-2 TPM070ZTW

2.2.1.2 TPEM070ZGW, TPM070ZGW

Figure 2-3 TPEM070ZGW, TPM070ZGW

2.2.1.3 TPEM121ZGM, TPM121ZGM, TPM121ZTM

Figure 2-4 TPEM121ZGM, TPM121ZGM, TPM121ZTM

2.2.1.4 TPEM150ZGX, TPM150ZGX, TPM150ZTX

Figure 2-5 TPEM150ZGX, TPM150ZGX, TPM150ZTX

2.2.2 Mounting Cutout

2.2.2.1 TPM070ZTW

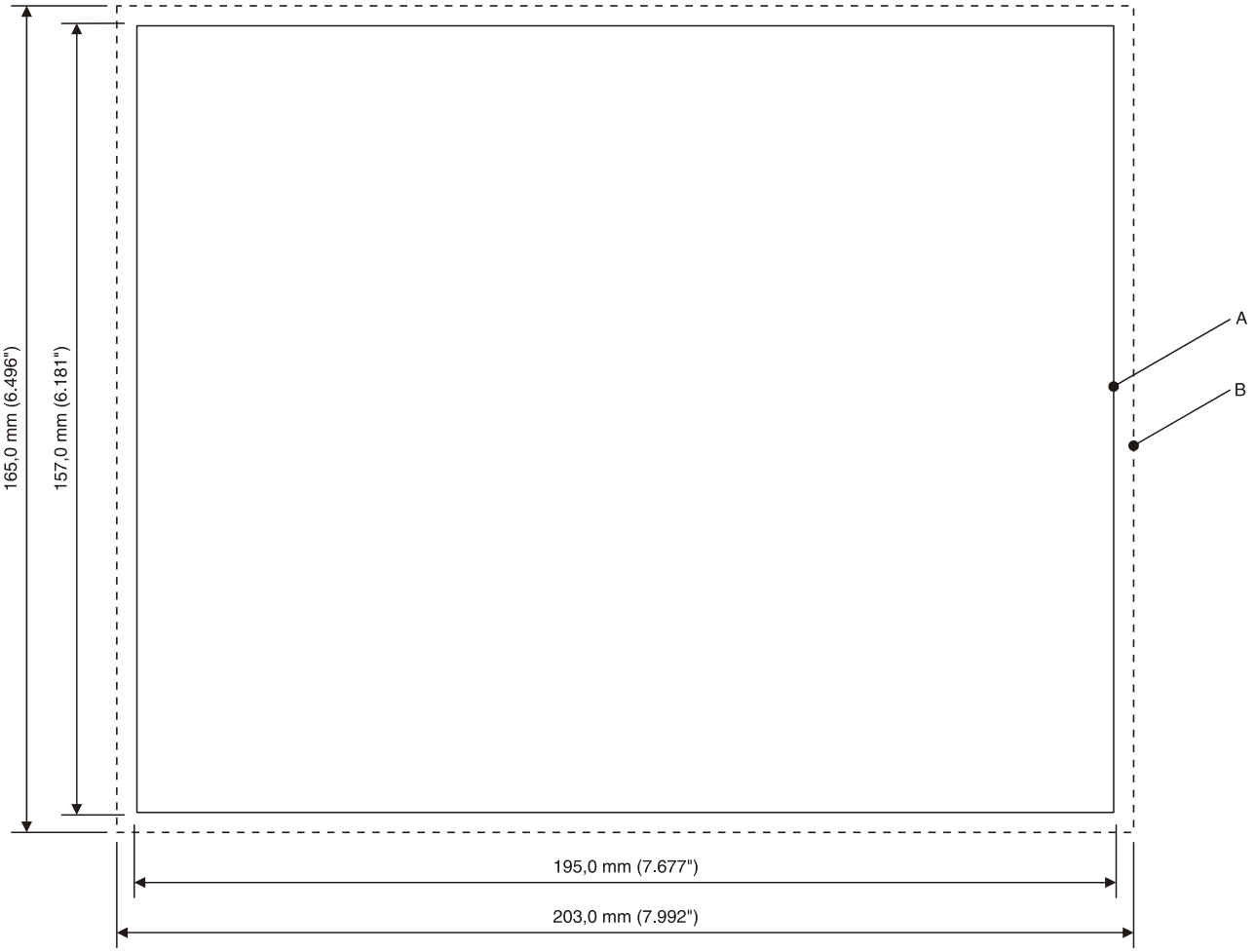


Figure 2-6 TPM070ZTW

A Mounting Cutout
B Front Panel

2.2.2.2 TPEM070ZGW, TPM070ZGW

Figure 2-7 TPEM070ZGW, TPM070ZGW

A Mounting Cutout
B Front Panel

2.2.2.3 TPEM121ZGM, TPM121ZGM, TPM121ZTM

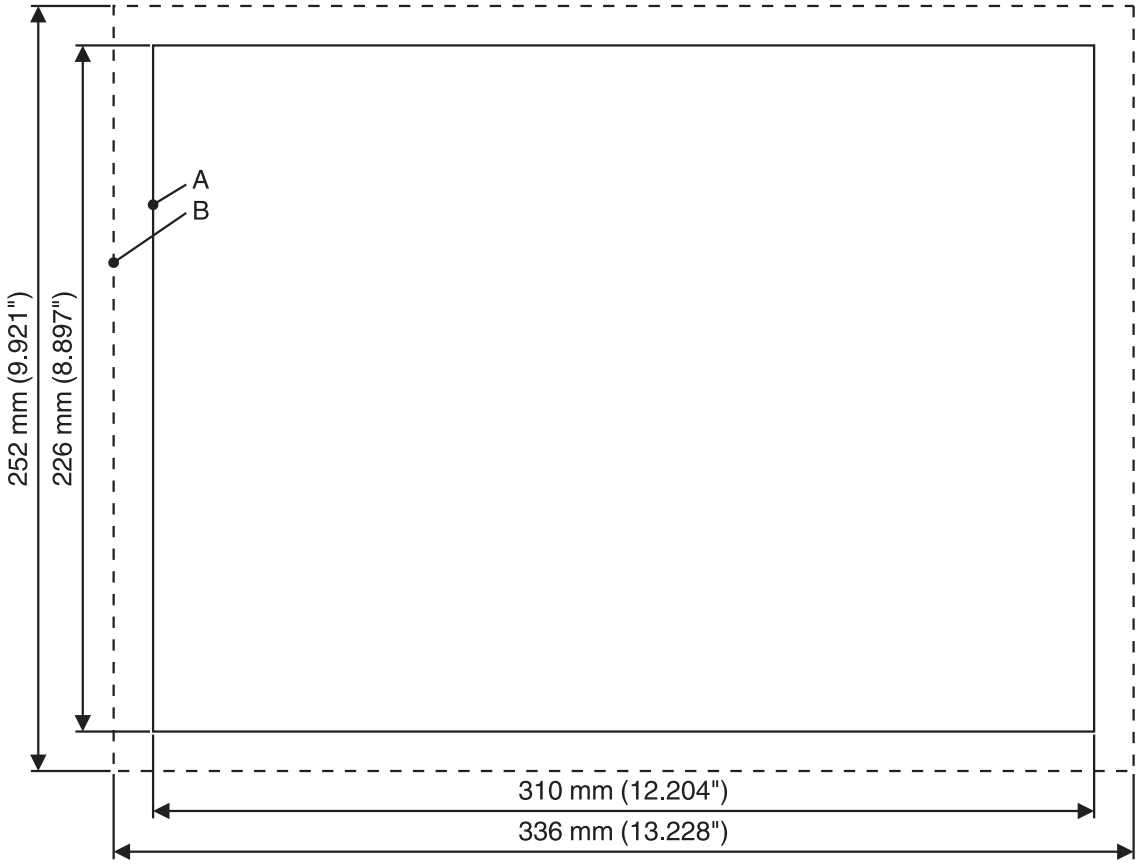


Figure 2-8 TPEM121ZGM, TPM121ZGM, TPM121ZTM

A Mounting Cutout
B Front Panel

2.2.2.4 TPEM150ZGX, TPM150ZGX, TPM150ZTX

Figure 2-9 TPEM150ZGX, TPM150ZGX, TPM150ZTX

A Mounting Cutout
B Front Panel

2.2.3 Side View, Mounting Depth

2.2.3.1 TPEM070ZGW, TPM070ZGW, TPM070ZTW

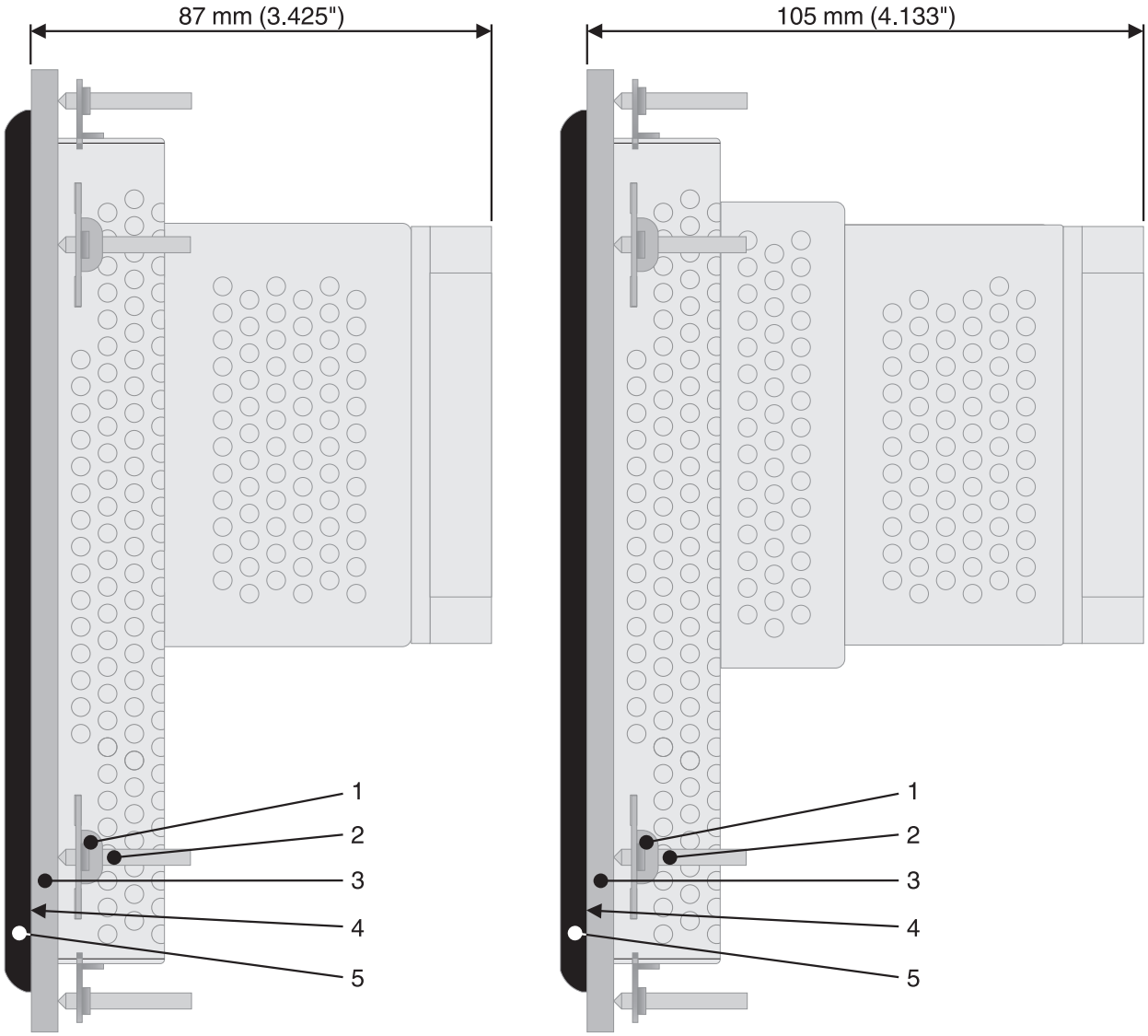


Figure 2-10 Mounting depth for the standard device / field bus device

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.2 TPEM121ZGM, TPM121ZGM, TPM121ZTM

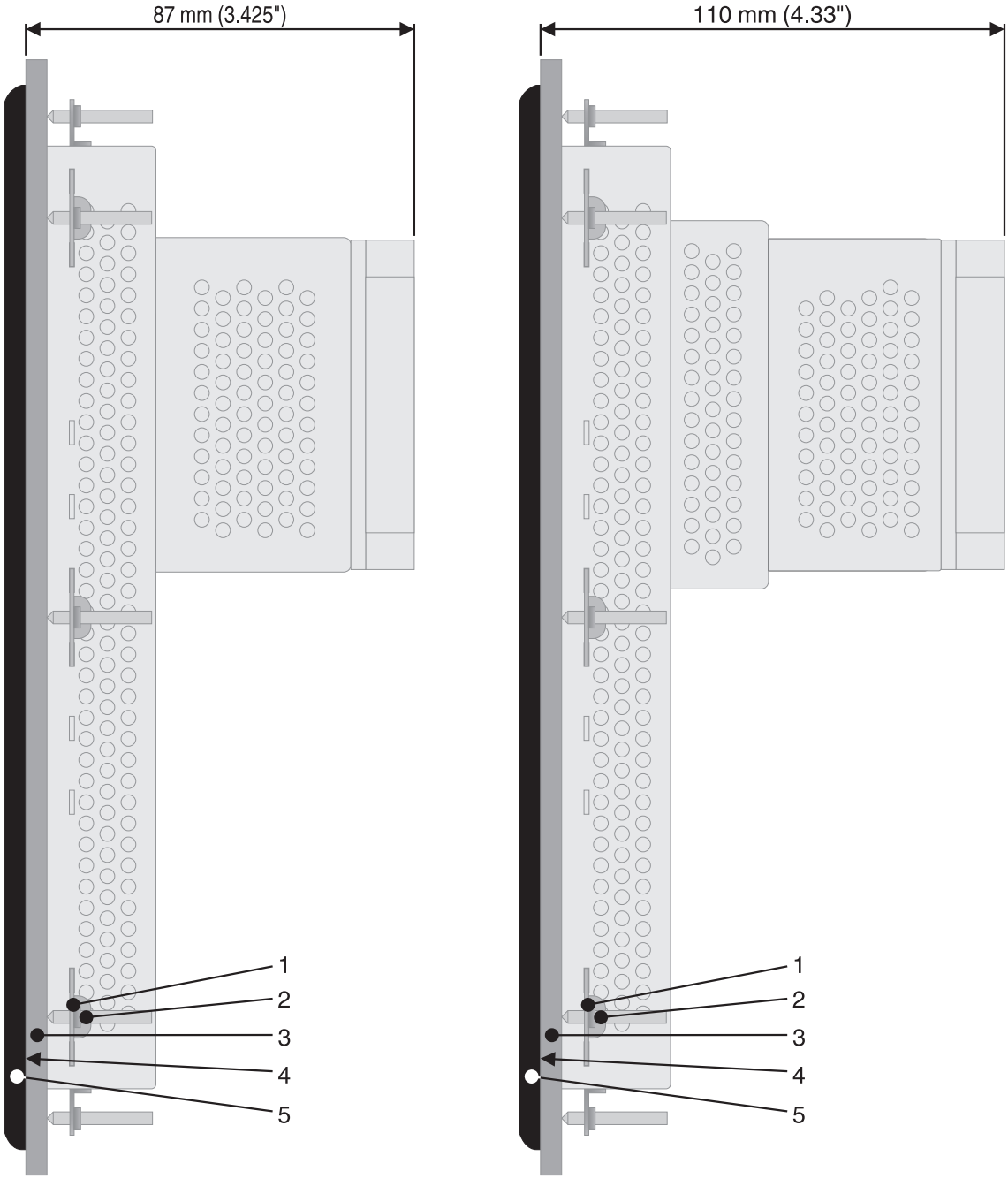


Figure 2-11 Mounting depth for the standard device / field bus device

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.2.3.3 TPEM150ZGX, TPM150ZGX, TPM150ZTX

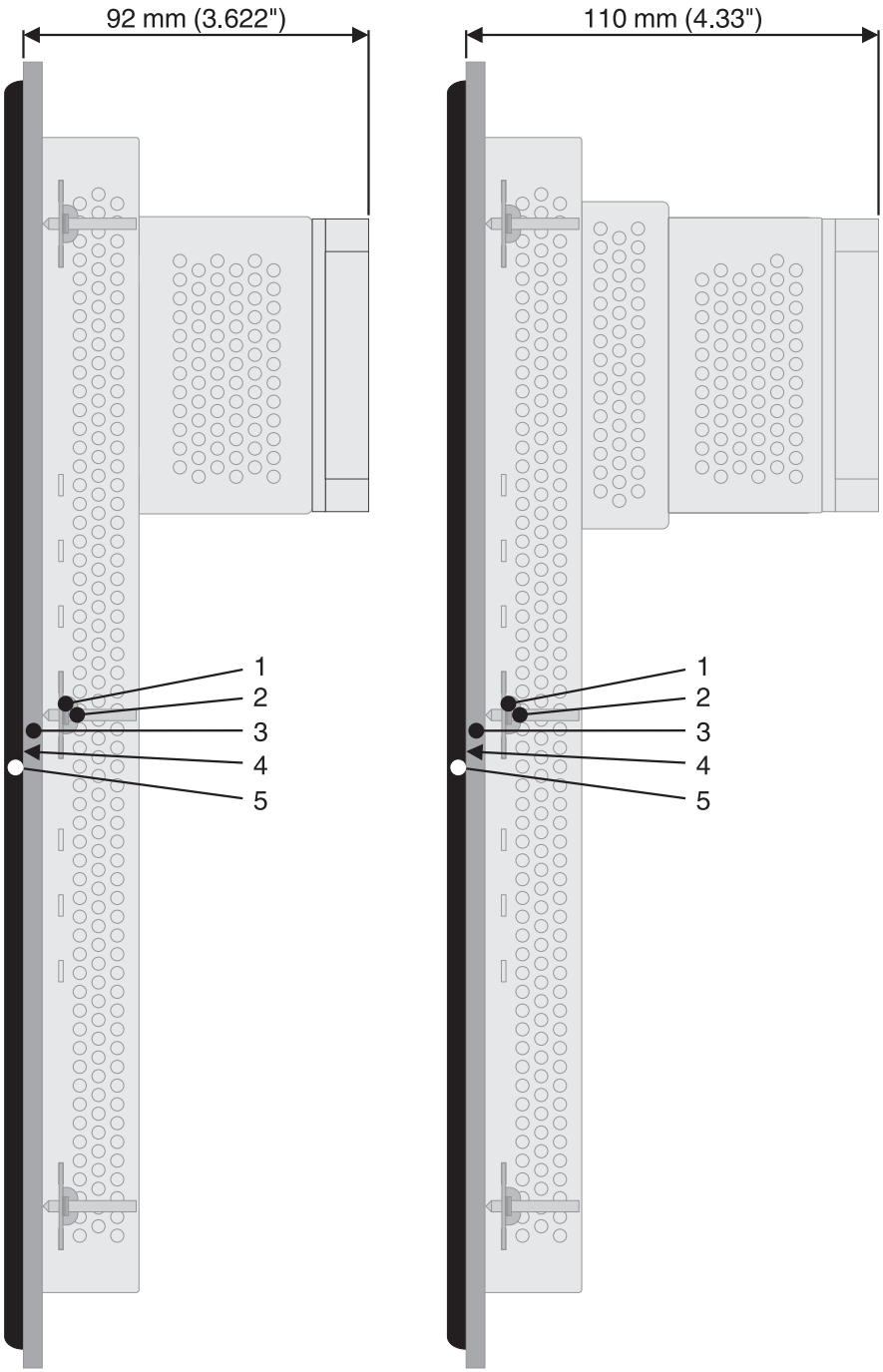


Figure 2-12 Mounting depth for the standard device / field bus device

1 Mounting Bracket
2 Threaded Pin
3 Mounting Surface Thickness 1 mm to 6 mm
4 Circumferential Seal
5 Front Panel

2.3 Connecting the Device

2.3.1 Supply Voltage

The supply voltage is supplied via pin strip X1. A suitable socket strip is supplied.

Refer to the technical data for the permissible supply voltage of the operating device.

The device has reverse polarity protection. In case of wrong polarity, the device will not operate.

This is a protection class I device. For safe operation, safety extra-low voltage (SELV) in accordance with DIN EN 61131 must be used for the supply voltage.

Connector in the operating device: 3 pin pin strip

Table 2-1 Pin assignment supply voltage

Pin	Designation	Function
1	⏚	Noiseless ground / functional earth ground (FE)
2	0 V	Supply voltage 0 V (GND)
3	⎓ 24 V	Supply voltage ⎓ 24 V

DANGER: Hazardous voltages
Hazardous voltages can exist inside electrical installations that can pose a danger to humans. Coming in contact with live parts may result in electric shock!

NOTICE: Damage
Cables with finely stranded copper conductors with a minimum cross-section of 0.75 mm² (18 AWG) and a maximum cross-section of 2.5 mm² (14 AWG) must be used for the supply voltage.
You must adhere to the following torques at the connector:
Screw connection of terminal blocks: 0.22 Nm (minimal) to 0.25 Nm (maximum)
Screw flange: 0.3 Nm (maximum)

Use the following procedure to connect the device to the supply voltage:

1. Strip approx. 30 mm (1.181") off the outer cable sheath and approx. 5 mm (0.197") off the wires.

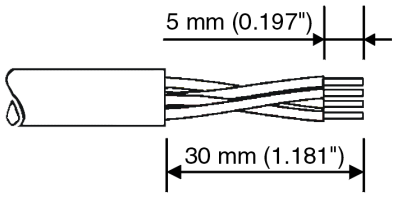


Figure 2-13 Preparing the cable

2. Fit the wires with wire end ferrules and connect the wires to the socket strip.
3. Plug the socket strip onto pin strip X1.
4. Secure the socket strip in place with a screw-type locking to prevent it from slipping out.

2.3.2 Grounding

The grounding is performed - depending on the type of device - with a slip-on sleeve (noiseless ground / functional earth ground) or a ring cable lug (protective ground).

NOTICE: Damage
A separate copper conductor must always be provided for the grounding. The conductor must have a minimum cross-section of 1.5 mm² (16 AWG) and must be kept as short as possible.
You must adhere to a maximum torque of 1 Nm at an protective grounding on the threaded bolt.

1. Strip approx. 5 mm (0.197") off the wires.
2. Fit the stripped wires - depending on the type of device - with a slip-on sleeve or a ring cable lug.
3. Plug the slip-on sleeve on the flat tab or mount the ring cable lug with the nut to the threaded bolt.

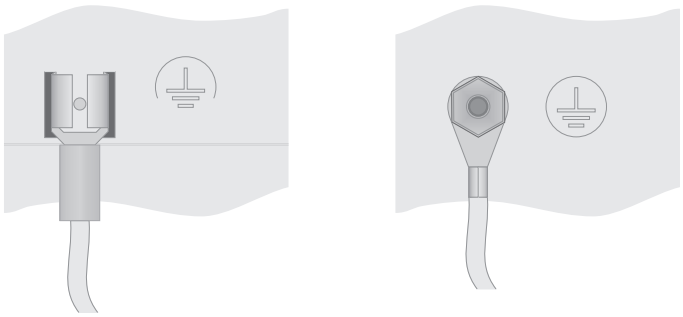


Figure 2-14 Noiseless ground / protective ground

2.4 Switching On

When switching on the operating system loads. The interface for SD/SDHC cards is available for applications and other data.

2.4.1 Cockpit

The operating device allows you - by starting the cockpit during the startup phase - to make changes to the device configuration.

Start cockpit at system startup

To start the cockpit, do the following:

1. Wait during the startup phase until the following dialog is displayed:

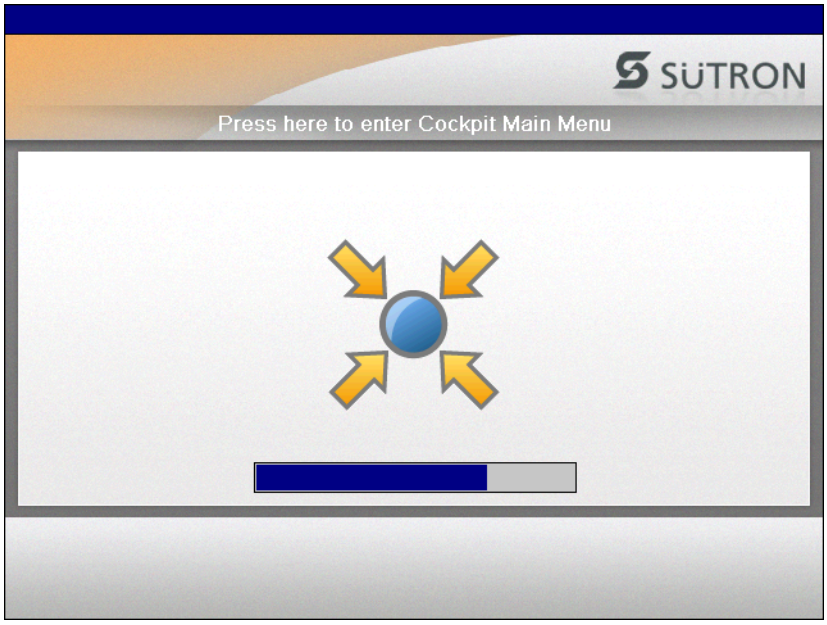


Figure 2-15 Cockpit startup phase

2. Press the button to start the cockpit before the progress bar is down.

You can customize the language of the cockpit interface at the language menu item.

3. Press the button **Language Selection**.
4. Select the desired language.
5. Confirm your selection with the green check.

Using desktop icon to start cockpit

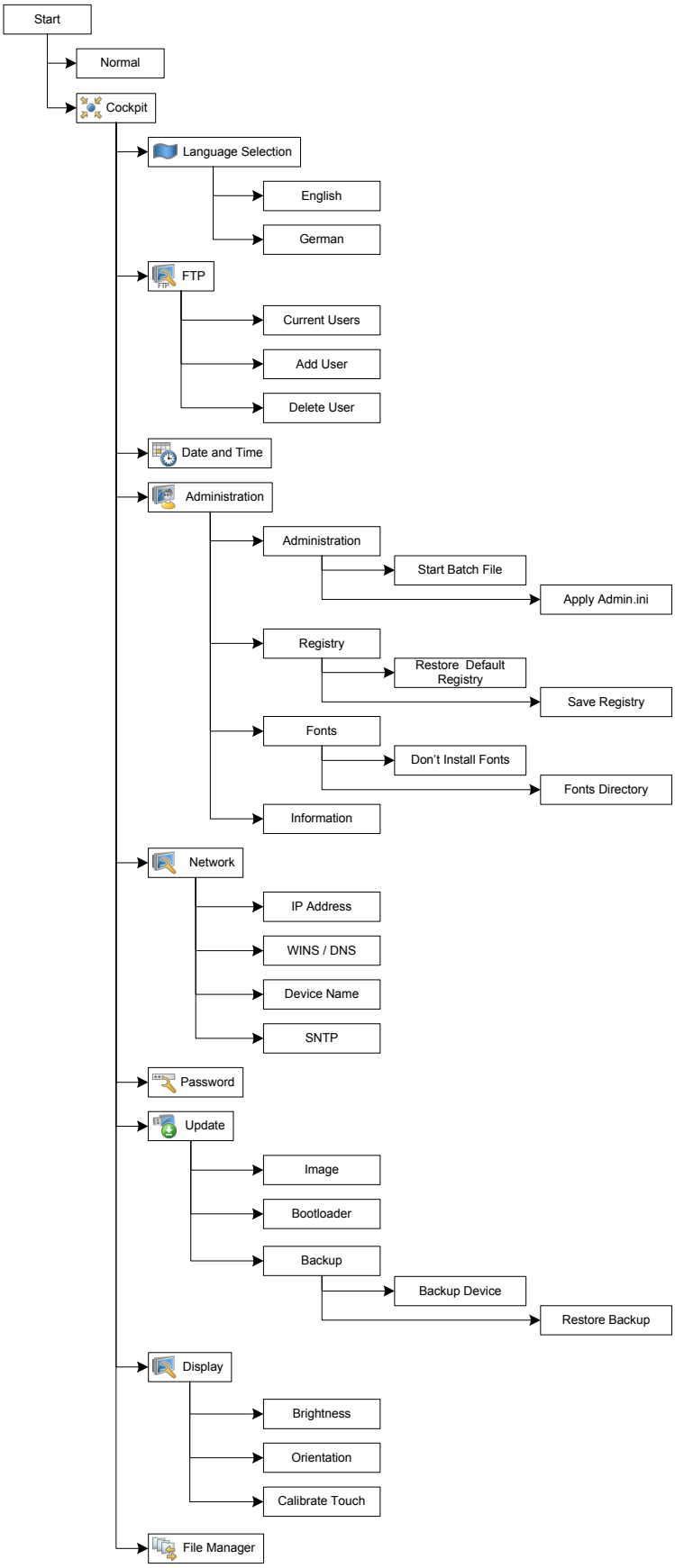
You can start the cockpit via the desktop icon at already started operating devices with active desktop:

1. Briefly press twice on the desktop icon.
2. Press the button to start the cockpit before the progress bar is down.

You can customize the language of the cockpit interface at the language menu item.

3. Press the button **Language Selection**.
4. Select the desired language.
5. Confirm your selection with the green check.

2.4.1.1 Menu Structure



2.4.1.2 Settings and Functions

Some settings are password-protected. The default password is "+-+-".

2.4.1.2.1 Language Selection

You can customize the language of the cockpit interface at the language menu item.

1. Select the desired language.
2. Confirm your selection with the green check.

2.4.1.2.2 FTP

You can configure FTP access to the operating device via the **FTP** menu.

Current Users

The list box displays all existing FTP users.

Add User

1. Enter a **user name** and **password** for the new FTP user.
2. Press the **Add User** button.

To change the password of an existing user, follow these steps:

1. Select the user name in the list box.
2. Enter the new password.
3. Press the **Add User** button to confirm the password.

Delete User

1. Select a user name in the **Current Users** list.
2. Press the **Delete User** button to delete the selected user.

Allow anonymous

This option allows FTP access with the user name and password „Anonymous“:

1. Select the **Allow anonymous** option.
2. Confirm your selection with the green check.
3. Restart the operating device for the changes to take effect.

2.4.1.2.3 Date and Time

You set up date, time and time zone via the **Date and Time** menu item.

2.4.1.2.4 Administration

The **Administration** menu allows you to run the Project.bat or Admin.ini and backup and restore the registry. In addition, you see device information.

Administration

Start Batch File

1. Open your FTP program or the Windows Explorer and enter the ip address of the operating device (example: ftp://149.208.160.232).
2. Download an existing file „project.bat“ from the root directory on your local file system or create a new file with this name.
3. Edit the file „project.bat“ with your favorite editor (e.g. „Notepad“) and add the following content:

```
\FlashDrv\MyFolder\MyProgram.exe -parameter
```

With the appropriate paths, different memory areas of the operating device can be accessed. Some paths are dependent on the product line of the operating device:

Product line(s)	Memory type	Path
All	USB stick	\HardDisk\
S Line, E Line, M Line, P Line	Internal	\FlashDrv\
E Line, M Line, P Line	Memory card	\StorageCard\

4. Save the file.
5. Copy the file „project.bat“ with the FTP program or the Windows Explorer into the root directory of the operating device.
6. Restart the operating device and press the cockpit button during startup.
7. Press the button **Administration**.
8. Press **Administration** to activate the area.
9. Press the **Start Batch File** button.

Your application will be started immediately.

Apply Admin.ini

1. Edit the file „Admin.ini“ in the root directory of your USB stick with your favorite editor (e.g. „Notepad“).

If the „Admin.ini“ does not exist, create the file.

2. Add the desired functions (see table) to the file or edit an existing entry.
3. Save the file.
4. Insert a USB stick into the female connector of the operating device.
5. Press the cockpit button during startup of the operating device.
6. Press the button **Administration**.
7. Press **Administration** to activate the area.
8. Press the **Apply Admin.ini** button.

The activated parameters are confirmed with a dialog.

9. Confirm this and the following dialogs with the OK button to complete the administration.
10. Remove the USB stick and restart the operating device.

Observe upper and lower case for all entries!

Possible contents for the Admin.ini file:

Start=explorer.exe	Starts the explorer
Start=MyProgram.exe	Starts the application MyProgram.exe Initial directory is windows. Use the following syntax to start an application on the usb stick: Start=\\\\HardDisk\\MyProgram.exe Use multiple entries to start several applications.
Registry=Default	Destroys the current registry and activates the default registry of the image. The change becomes effective on the next device reboot.
Lock=On	The button to start the cockpit is locked. The button is only active when a USB stick with the file Admin.ini is detected.
Lock=Off	The button to start the cockpit is activated.
Mode=Development	The shell has full functionality. The change becomes effective on the next device reboot.
Mode=Standard	The Shell is restricted: No task bar and task switch available. Desktop contains the cockpit icon only. The change becomes effective on the next device reboot.
DeviceName=MyName	Defines the device name of the operating device
;DeviceName=MyName	Comment, no impact

Registry

Restore Default Registry

Destroys the current registry and activates the default registry of the image.

Save Registry

The registry is saved completely.

Fonts

Install Fonts

The fonts in the default directory or user-specific directory will be installed automatically when you start the operating device.

Depending on the number and size of fonts, the system start-up take correspondingly more time.

Fonts Directory

The fonts in this directory are used if the „Install Fonts“ option is active. If no directory is given the appropriate default directory is used:

Product line(s)	Memory type	Default directory
S Line, E Line	Internal	\FlashDrv\Fonts\
M Line, P Line	Memory card	\StorageCard\Fonts\

Information

The following informations are displayed:

- Device type,
- Serial number,
- Software bundle
- Image name,
- Image date,
- Operating system,
- Operating system version.

2.4.1.2.5 Network

You can configure the network settings with the **Network** menu item.

IP Address

Use Dynamic IP (DHCP)

The network configuration is automatically obtained from the DHCP server.

Confirm your selection with the green check.

Use Static IP

Manually assign an ip address, subnet mask and gateway of the operating device.

Confirm your selection with the green check.

WINS / DNS

Optionally, enter the addresses for the WINS / DNS server.

Confirm your selection with the green check.

The input fields are only active when you set up a static ip.

Device Name

You can define a device name with a maximum of 15 characters. Via network, the device can be accessed with the device name instead of the ip address.

Confirm your selection with the green check.

SNTP

Enter the address of an intranet or internet time server. Define an interval in milliseconds for time synchronization.

Confirm your selection with the green check.

2.4.1.2.6 Password

The menu item **Password** allows you to protect certain menu items in the cockpit with a password.

Current password

1. Enter a password for the protected menu items.

2. Confirm your selection with the green check.

Password protected

1. Select the menu items which shall get a password protection.
2. Confirm your selection with the green check.

2.4.1.2.7 Update

You can update the image and the bootloader with the menu item **Update**. The image includes the operating system and product-specific data. The bootloader starts the operating system and product-specific functions.

Image

Start update

1. Press the **Open** button.
2. Navigate with the dialog into the folder with the image file.
3. Select the image file.
4. Press the **OK** button.
5. Press the **Start Update** button.
6. Press the **OK** button at the dialog to start the update.

NOTICE
Please do not interrupt the power supply during the process. After canceling an process, the operating device may not be operational anymore.

The successful update will be confirmed with a dialog.

7. Restart the operating device.

Bootloader

Start update

1. Press the **Open** button.
2. Navigate with the dialog into the folder with the bootloader file.
3. Select the bootloader file.
4. Press the **OK** button.
5. Press the **Start Update** button.
6. Press the **OK** button at the dialog to start the update.

NOTICE
Do not interrupt the power supply during the process. After canceling an process, the operating device may not be operational anymore.

The successful update will be confirmed with a dialog.

7. Restart the operating device.

Backup

Backup Device

1. Insert a USB stick into the female connector of the operating device.
2. Press the button **Backup Device**.

The files are copied to the directory "Backup" on the USB stick. A dialog lets you know if there is already a directory „Backup“ with data on the USB stick. If you confirm this dialog the existing backup is overwritten.

The successful backup will be confirmed with a dialog.

Restore Backup

NOTICE
When restoring the backup all data in the flash memory of the operating device will be deleted.

The process of backup and restore all settings is possible only with identical device types.

1. Insert a USB stick into the female connector of the operating device.
2. Press the **Restore Backup** button.

NOTICE
Do not interrupt the power supply during the process. After canceling an process, the operating device may not be operational anymore.

The backup files are copied from the directory "Backup" to the flash memory of the operating device.

The successful update will be confirmed with a dialog.

3. Restart the operating device.

2.4.1.2.8 Display

You can carry out settings such as brightness and orientation of the display and the calibration of the touch via the **Display** menu item.

Brightness

1. Adjust the brightness using the slider or the arrow symbols.
2. Confirm your selection with the green check.

Dim Backlight

The brightness of the backlight is reduced after the defined time (minutes). The value „0“ disables the function.

Switch Off Backlight

The brightness of the backlight is switched off after the defined time (minutes). The value „0“ disables the function.

Orientation

1. Turn the orientation using the buttons **Turn left** and **Turn right** to the desired position.
2. Confirm your selection with the green check.

Depending on device type, the new orientation is accepted immediately or after a reboot of the operating device.

3. Press the **OK** button.

Calibrate Touch

1. Press the **Recalibrate** button.

Depending on device type the calibration is automatically started immediately or after a reboot of the operating device.

2. Press the displayed marks to calibrate the touch.

2.4.1.2.9 File Manager

Use the file manager to copy files and directories between the storage medias (USB stick <-> device memory). You can also delete files and directories.

Copy file(s) / folder(s)

1. Select one or multiple files / folders.
2. Press the **<<** button to copy the data to the USB stick or **>>** to copy the data on the device memory.

Delete file(s) / folder(s)

1. Select one or multiple file(s) / folder(s).
2. Press the Delete button to delete the data from the USB stick or the device memory.

2.5 Identification

The operating device can be identified using the nameplate on the rear of the device.

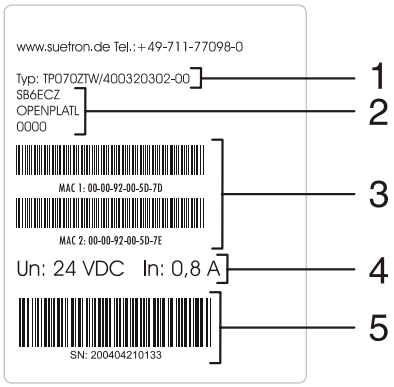


Figure 2-16 Nameplate (example)

1 Device Type
2 Software Version (Version on Delivery)
3 MAC Addresses
4 Voltage and Current
5 Serial Number

3 Control and Display Elements

3.1 Touch Screen

The device is equipped with a touch screen. You operate the device using this touch screen.

3.2 Display

DANGER: Toxic
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

DANGER: Corrosive
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

Pixel failures, which can occur with TFT displays, are due to production and no complaint reason!

The operating device is equipped with different displays depending on variant.

4 Interfaces of the Device

4.1 Standard Interfaces

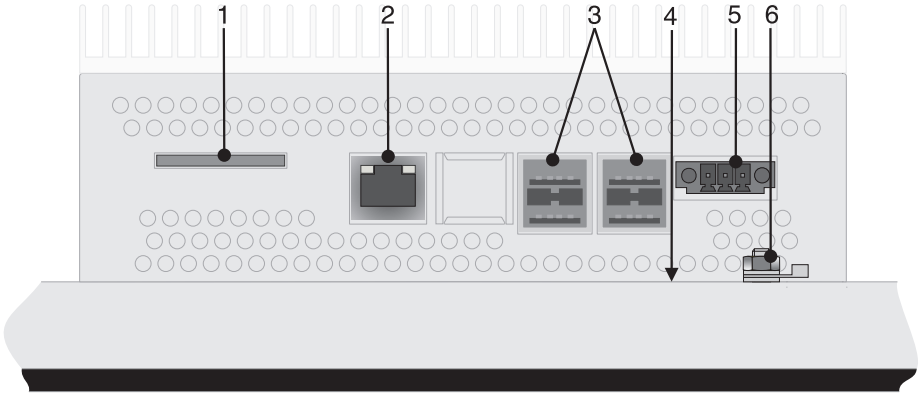


Bild 4-1 Rear view

1 Slot for SD / SDHC Memory Card
2 Ethernet X7 (10/100/1000 MBit)
3 Female Connector X2 - X5 (USB Host - Type A)
4 Male Connector X11 (External Alarm Indicator)
5 Connector X1 (Supply Voltage)
6 Threaded Bolt For Protective Grounding

4.1.1 Ethernet

10/100/1000 Base-T Ethernet interfaces are available at the operating device.

4.1.1.1 Pin Assignment

Connector in the operating device: RJ45 female connector.

Tabelle 4-1 Pin assignment of the Ethernet interface

Pin	Designation	Function
1	D1+	Data Line 1, Positive Polarity
2	D1-	Data Line 1, Negative Polarity
3	D2+	Data Line 2, Positive Polarity
4	D3+	Data Line 3, Positive Polarity
5	D3-	Data Line 3, Negative Polarity
6	D2-	Data Line 2, Negative Polarity
7	D4+	Data Line 4, Positive Polarity
8	D4-	Data Line 4, Negative Polarity

4.1.1.2 Cable

ACHTUNG
Use a twisted pair cable of category 5 or 6 (CAT 5 or 6). Use twisted pair cable of category 6 for optimal transfer rate at 1000 Base-T. The maximum cable length is 100 m (328.084 feet).

See the IEEE 802.3 standard for further information.

4.1.1.3 Diagnosis

Ethernet diagnostics LEDs are located at the operating device.

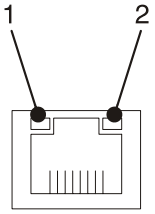


Bild 4-2 Position of the ethernet diagnostics LEDs

Tabelle 4-2 Function of the ethernet diagnostics LEDs

No.	Color	State	Function
1	Green	Flashing	Sending / Receiving activity 100/1000 MBit
	Yellow	Flashing	Sending / Receiving activity 10 MBit
2	Yellow	On	1000 MBit
	Green	On	100 MBit
	-	Off	10 MBit

4.1.2 USB

USB interfaces are available at the operating device to connect periphery equipment (for example: Mass memory, printer, scanner, mouse, keyboard etc.).

NOTICE
Using the USB interfaces while normal operating mode is not permitted for maritime applications!
For maritime applications the use of the USB interfaces is allowed for servicing operations only!

NOTICE
Using hardware not suitable for industrial use (e.g. keyboard, mouse, memory card) may decrease safety of operation. This includes hardware intended for home and office use.

4.1.2.1 Cable

For the specification of a suitable cable, please refer to the „Universal Serial Bus Specification Rev. 2.0“.

NOTICE
Use industrial-suited USB cables with a length of maximally 2.5 m (8.202 feet).

4.1.3 External Alarm Indicator (X11)

The operating device is equipped with a potential-free relay make contact, which is switched simultaneously with the internal alarm indicator.

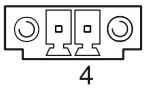


Bild 4-3 Male connector for external alarm indicator

Connect this output with an alarm indicator which is provided by a separate voltage supply.

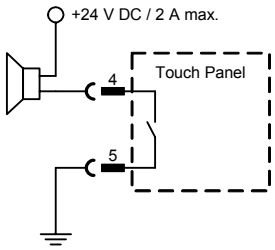


Bild 4-4 Wiring diagram for the external alarm indicator

4.1.4 Memory Card

At the underside of the operating device you can plug in an SD card.

NOTICE
Using hardware not suitable for industrial use (e.g. keyboard, mouse, memory card) may decrease safety of operation. This includes hardware intended for home and office use.

4.1.4.1 Inserting the memory card

If you insert the memory card, the back side (side with contacts) of the memory card must be visible. Insert the memory card until it clicks.

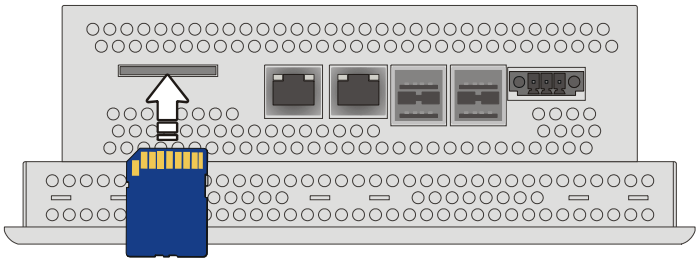


Figure 4-5 Inserting the memory card

4.1.4.2 Ejecting the memory card

To remove, push the memory card into the operating device until it clicks. The memory card bounces when released automatically out of the operating device. Now you can remove the memory card.

4.2 Serial Interfaces

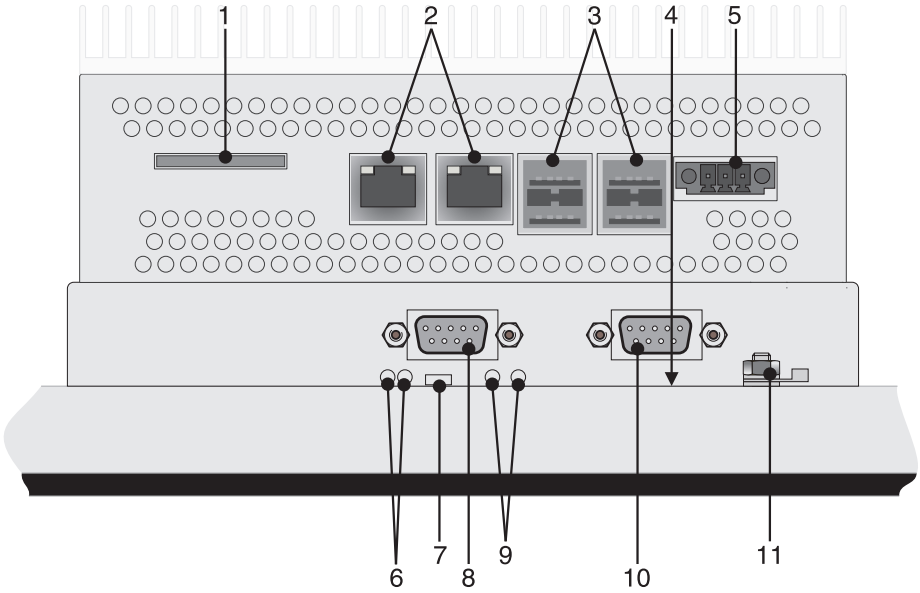


Figure 4-6 Rear view RS-422 / RS-485, RS-232

1 Slot for SD / SDHC Memory Card
2 Ethernet X7, X6 (10/100/1000 MBit)
3 Female Connector X2 - X5 (USB Host - Type A)
4 Male Connector X11 (External Alarm Indicator)
5 Connector X1 (Supply Voltage)
6 Diagnostics LEDs (RS-422/RS-485)
7 Termination Switch (RS-422/RS-485)
8 Male Connector X14 (RS-422/RS-485)
9 Diagnostics LEDs (RS-232)
10 Male Connector X15 (RS-232)
11 Threaded Bolt For Protective Grounding

4.2.1 RS-422 / RS-485 (X14)

The interface standard RS-422 / RS-485 is suitable for point-to-point and multi-point connections.

The wires belonging together are marked with „A“ and „B“. Some descriptions refer to the pins with „-“ and „+“ , where A = - and B = +.

Signal Logic 1 $U_A - U_B <= -0.3$ V i.e. ($U_A < U_B$)

Signal Logic 0 $U_A - U_B >= +0.3$ V i.e. ($U_A > U_B$)

The interface is assigned to the port COM4. At an image version before 181 and operating system Windows CE 6.0 the port COM1 is assigned.

4.2.1.1 Pin Assignment

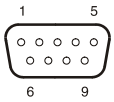


Figure 4-7 9 pin D-SUB male connector strip

Connector in the operating device: 9 pin D-SUB male connector strip.

Table 4-3 Pin assignment RS-422/RS-485

Pin	Designation	Function		
1	SGND	Signal Ground		
2	T(B)	Transmitted Data	+	P
3	T(A)	Transmitted Data	-	N
4	R(A)	Received Data	-	N
5	R(B)	Received Data	+	P
6	nc	Not Connected		
7	nc	Not Connected		
8	nc	Not Connected		
9	nc	Not Connected		

NOTICE
The D-SUB connector strips must be shielded sufficiently. See chapter “Shielding D-SUB Connectors“ on page 6-50.

4.2.1.2 Termination

Always turn on the termination in a 4-wire point-to-point connection (RS-422 / RS-485). A sender termination for the quiescent level of the receiver must exist on the remote station.

Turn on the termination only at the two ends of the lines in a 2- or 4-wire multi-point connection (RS-422 / RS-485).

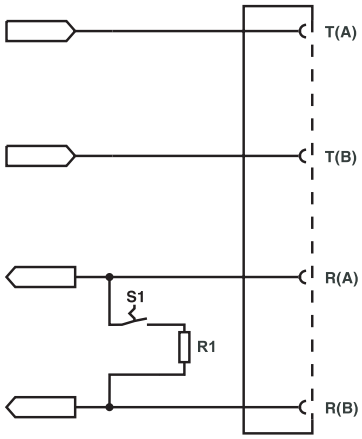


Figure 4-8 Termination possibilities RS-422 / RS-485 (intern)

Table 4-4 Resistance values termination RS-422 / RS-485

Designation	Value
R1	120 Ohm

The switch positions for ON or OFF are printed onto the operating device. Only the specified switch positions are allowed.

Table 4-5 Termination switch RS-422 / RS-485

Switch position	Function
ON	Receiver termination (120 Ohm)
OFF	No receiver termination

4.2.1.3 Transmitter Control

Switching between half-duplex and full-duplex is carried out by the DTR signal.

Full-duplex (DTR inactive / off):

The transmitter is always active and is not turned off on intermissions.
The receiver is always active.

Full-duplex (DTR active / on):

The transmitter is activated during the transmission. On intermissions, the transmitter is highly resistive.
The receiver is disabled during the transmission. The operating device does not receive the own transmit data at the receiver.

4.2.1.4 Diagnosis

Diagnostics LEDs are located on the rear of the operating device.

The diagnostic LEDs at the operating device have the following functions:

Table 4-6 Functions of the RS-422 / RS-485 diagnostics LEDs

Designation	Color	State	Function
Rx	Green	Flashes	Data transfer active
Tx	Yellow	Flashes	Data transfer active

4.2.2 RS232 (X15)

The serial RS-232 interface is suitable to establish a point-to-point connection.

The interface is assigned to the port COM3. At an image version before 181 and operating system Windows CE 6.0 the port COM0 is assigned.

4.2.2.1 Pin Assignment

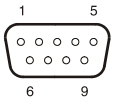


Figure 4-9 9 pin D-SUB male connector strip

Connector in the operating device: 9 pin D-SUB male connector strip.

Table 4-7 Pin assignment RS-232

Pin	Designation	Function
1	nc	Not Connected
2	RD	Received Data
3	TD	Transmitted Data
4	nc	Not Connected
5	GND	Ground
6	nc	Not Connected
7	RTS	Request to Send
8	CTS	Clear to Send
9	nc	Not Connected

NOTICE
The D-SUB connector strips must be shielded sufficiently. See chapter “Shielding D-SUB Connectors“ on page 6-50.

4.2.2.2 Diagnosis

Diagnostics LEDs are located on the rear of the operating device.

The diagnostic LEDs at the operating device have the following functions:

Table 4-8 Functions of the RS-232 diagnostics LEDs

Designation	Color	State	Function
RD	Green	Flashes	Data transfer active
TD	Yellow	Flashes	Data transfer active

4.3 Field Bus Interfaces

4.3.1 CAN (X12, X13)

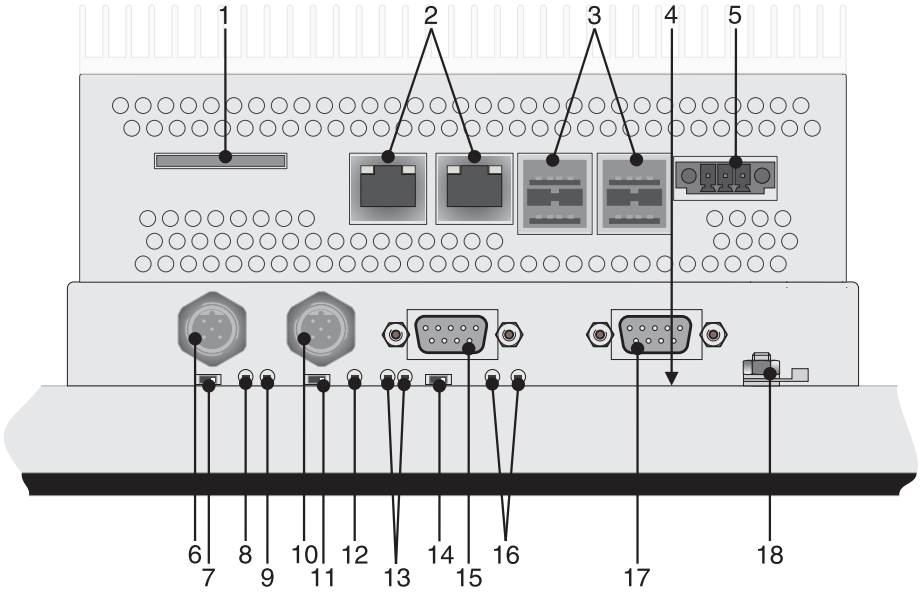


Bild 4-10 Rear view CAN

1 Slot for SD / SDHC Memory Card
2 Ethernet X7, X6 (10/100/1000 MBit)
3 Female Connector X2 - X5 (USB Host - Type A)
4 Male Connector X11 (External Alarm Indicator)
5 Connector X1 (Supply Voltage)
6 Male Connector X12 (CAN1)
7 Termination Switch (CAN1)
8 Diagnostics LEDs (CAN1)
9 Diagnostics LEDs (Microcontroller)
10 Male Connector X13 (CAN2)
11 Termination Switch (CAN2)
12 Diagnostics LEDs (CAN2)
13 Diagnostics LEDs (RS-422/RS-485)
14 Termination Switch (RS-422/RS-485)
15 Male Connector X14 (RS-422/RS-485)
16 Diagnostics LEDs (RS-232)
17 Male Connector X15 (RS-232)
18 Threaded Bolt For Protective Grounding

4.3.1.1 Pin Assignment

Figure 4-11 5 pin M12 male connector

Connector in the operating device: 5 pin M12 male connector.

Table 4-9 Pin assignment CAN 1

Pin	Designation	Function
1	PE	Shielding
2	Reserved	Reserved for DeviceNet
3	CAN1_GND	CAN Ground
4	CAN1_H	CAN_H Bus Line
5	CAN1_L	CAN_L Bus Line

Table 4-10 Pin assignment CAN 2

Pin	Designation	Function
1	PE	Shielding
2	Reserved	Reserved for DeviceNet
3	CAN2_GND	CAN Ground
4	CAN2_H	CAN_H Bus Line
5	CAN2_L	CAN_L Bus Line

NOTICE
The M12 connectors must be connected to the cable shield.

4.3.1.2 Cable

NOTICE
A shielded twisted-pair cable complying with ISO 11898-2 must be used.

A suitable cable with the designation „SAC-5P- 2,0-920/FS SCO“ is offerd by Phoenix Contact GmbH with article number 1518216.

The maximum cable length depends on the data transfer rate used.

Table 4-11 Bit rate CAN

Bit rate	Cable length
125 kBit/s	500 m
500 kBit/s	100 m
1 MBit/s	40 m

4.3.1.3 Termination

Terminate the CAN bus at both ends by terminating resistors (120 Ohm).

The switch positions for ON or OFF are printed onto the operating device. Only the specified switch positions are allowed.

Table 4-12 Termination switch CAN

Switch position	Function
ON	Termination (120 Ohm)
OFF	No termination

4.3.1.4 Diagnosis

Diagnostics LEDs are located on the rear of the operating device. The LEDs show the states of the bus system.

The diagnostics LEDs at the operating device have the following functions:

Tabelle 4-13 Functions of the CAN diagnostics LEDs

Designation	Color	State	Function
CAN1	Green	On	Node is operational
	Green	Flashes	Node is not operational
CAN2	Green	Ein	Node is operational
	Green	Flashes	Node is not operational
µC	Green	Off	Microcontroller inactive
	Green	Flashes slowly	Microcontroller is operational
	Green	Flashes slowly and fast	Microcontroller is operational Requests of the host CPU are received and processed

4.4 Shielding D-SUB Connectors

You must shield D-SUB connectors as follows:

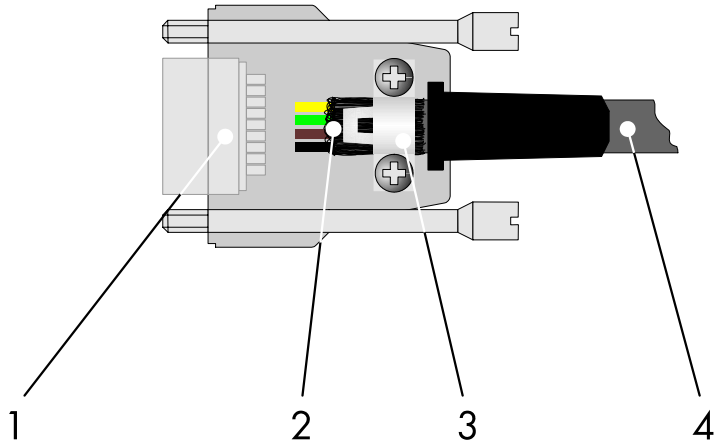


Bild 4-12 Shielding D-SUB connectors

1 D-SUB connector

2 Shield

3 Cable clip

4 Cable

The shield must be folded back into a flat position over the cable sheath.

When fastening the cable with the cable clip, as much of the shielding as possible must be in contact with the housing and sufficient strain relieve must be ensured.

5 Maintenance and Servicing

5.1 Maintenance Interval

The following maintenance intervals are recommended for this operating device:

Tabelle 5-1 Maintenance interval

Maintenance work	Interval
Changing the Battery	4 Years

5.2 Front Panel

Only use a damp cloth to remove any dirt from the front panel.

5.3 Fuse

NOTICE: Damage
The semiconductor fuse cannot be replaced!

A semiconductor fuse is used to protect the device. Once the fuse has been tripped, the device must be disconnected from the supply voltage to allow the semiconductor fuse to regenerate. At an ambient temperature of 20 °C (68 °F), the regeneration takes approximately 20 seconds. The higher the ambient temperature, the longer the regeneration takes.

5.4 Battery

The minimum battery life is 5 years, even under unfavorable operating conditions.

We recommend you change the battery approximately every 4 years as part of the regular maintenance work.

5.4.1 Changing the Battery

NOTICE: Damage
Batteries must only be changed by authorized and trained experts!

NOTICE: Damage
Electrostatic discharge can damage electronic components. Observe the ESD protective measures!

CAUTION: Explosive
Do not throw lithium batteries into fire, do not heat to 100 °C or higher and do not recharge.

CAUTION: Toxic
Do not open lithium batteries.

After a battery change, you must set the date and time newly!

1. Remove the connector of the supply voltage.
2. Remove the screws with the help of a screwdriver (see picture).
3. Remove the enclosure.
4. Disconnect the connector from the battery and remove the dead battery.
5. Plug in the cable of the new battery.
6. Use a provided glue strip to attach the new battery.
7. Place the enclosure cover back onto the device,
8. Carefully tighten the screws of the enclosure cover.

Take care at the assembly of the enclosure cover that all enclosure latches click into the corresponding slits of the underlying enclosure.

9. Put the connector for the supply voltage on again.
10. Set the current date and time.

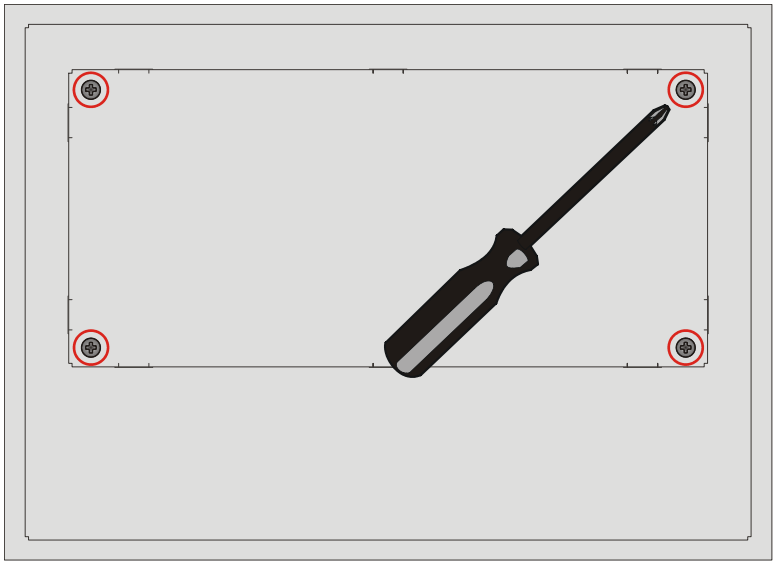
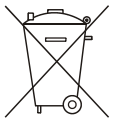


Figure 5-1 Enclosure screws at the operating device

5.4.2 Battery Disposal



The manufacturer is obliged to mark batteries with this symbol before first placing into market. The symbol is extended by the chemical symbols if the following limiting values are exceeded:

More than 0.0005 mass percent mercury	Hg
More than 0.002 mass percent cadmium	Cd
More than 0.004 mass percent lead	Pb

Batteries can be given back free of charge after use at the place of purchase.

According to the §11 of the battery law, final consumers are obligedly to give old batteries back to gathering points which attached to the common take back system or manufacturer-specific take back systems.

NOTICE: Damage
To prevent short circuitry in the collection boxes, insulate the poles of each battery with insulation tape or put each single battery into a plastic bag.

6 Technical Data

6.1 General

Ethernet	
Ethernet	10/100/1000 Mbit/s

USB
In accordance with the „Universal Serial Bus Specification Rev. 2.0“
Min.: 1.5 Mbit/s Max.: 480 Mbit/s Max. output current: 100 mA per output

Central Processing Unit	
Central processing unit	Intel® Atom™
Clock frequency	1.6 GHz

Memory	
RAM	2 GByte DDR2
Flash	8 GByte / 16 GByte / 32 GByte / 64 GByte
SD/SDHC interface	2 GByte / 32 GByte maximum

Connection Method
Female and male connector strip PHOENIX CONTACT MINI COMBICON, 3 pin
RJ45 female connector
USB female connector A

Standards and Guidelines	
Interference immunity	EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6 EN 61000-6-2
Emitted interference	EN 61000-6-4 EN 50011 limit class value A EN 50022 limit class value A
Equipment requirements	EN 61131
Storage and transportation	EN 61131 part 2
Power supply	EN 61131 part 2
Electromagnetic compatibility	2004/108/EG
Degree of protection	EN 60529
Impact load, shocks	EN 60068 part 2-27
Sinusoidal vibrations	EN 60068 part 2-6
Corrosion protection	IEC 60068

NOTICE: Radio Interference
This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate countermeasures, and to bear the cost of same.

Zulassungen
ABS, BV, CE, DNV, GL, LR, UL, cUL

6.2 TPEM070ZGW

Touch Screen	
Type	Low Reflective GFG (glass film glass), analog resistive, 4 wire technology
Activation force	Input area A (area within 20 mm, circulating): Minimum / maximum: 0,3 N / 1,5 N Average: 0,9 N Input area B (marginal area of 20 mm, circulating): Minimum / maximum: 0,5 N / 2,5 N Average: 1,2 N With R8 silicon rubber
Durability	No damages or malfunctions after 10 million keystrokes as the following: Keystroke element: R8 silicon rubber Keystroke load: 250 g Keystroke frequency: 2 Hz

Display	
Size (diagonal) in cm (inch)	17.78 (7)
Type	TFT (color)
Resolution (pixels)	800 x 480
Colors	262144
Reading angle (vertical / horizontal)	130° / 140°
Half-life backlighting	40,000 h
Brightness in cd/m^2	350
Display area (H x W) in mm (Inch)	91.4 x 152.4 (3.598 x 6.0)

Environmental Conditions	
Temperature during operation	- 20 °C to + 60 °C (- 4 °F to 140 °F)
Temperature during storage, transport	- 30 °C to + 70 °C (- 22 °F to 158 °F)
Relative air humidity for operation and storage	Front: 5 % to 95 % Rear: 20 % to 85 %, no condensation
Operating altitude (above-sea level)	0 m to 4000 m
Application area	Degree of pollution 2, overvoltage category III

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Power consumption (typical at 24 V)	0.7 A
Connected load	16.8 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	173 x 211 x 5 (6.811 x 8.307 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	165 x 203 (6.496 x 7.992)
Mounting depth in mm (Inch) - (standard / field bus)	About 87 (3.425) / 105 (4.133)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1100 g

6.3 TPM070ZGW

Touch Screen	
Type	Low Reflective GFG (glass film glass), analog resistive, 4 wire technology
Activation force	Input area A (area within 20 mm, circulating): Minimum / maximum: 0,3 N / 1,5 N Average: 0,9 N Input area B (marginal area of 20 mm, circulating): Minimum / maximum: 0,5 N / 2,5 N Average: 1,2 N With R8 silicon rubber
Durability	No damages or malfunctions after 10 million keystrokes as the following: Keystroke element: R8 silicon rubber Keystroke load: 250 g Keystroke frequency: 2 Hz

Display	
Size (diagonal) in cm (inch)	17.78 (7)
Type	TFT (color)
Resolution (pixels)	800 x 480
Colors	262144
Reading angle (vertical / horizontal)	130° / 140°
Half-life backlighting	40,000 h
Brightness in cd/m^2	350
Display area (H x W) in mm (Inch)	91.4 x 152.4 (3.598 x 6.0)

Environmental Conditions	
Temperature during operation	0 °C to 55 °C (- 32 °F to 131 °F)
Temperature during storage, transport	- 25 °C to + 70 °C (- 13 °F to 158 °F)
Relative air humidity for operation and storage	20 % to 85 %, no condensation
Application area	Degree of pollution 2, overvoltage category III No direct solar radiation

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Power consumption (typical at 24 V)	0.7 A
Connected load	16.8 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	173 x 211 x 5 (6.811 x 8.307 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	165 x 203 (6.496 x 7.992)
Mounting depth in mm (Inch) - (standard / field bus)	About 87 (3.425) / 105 (4.133)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1100 g

6.4 TPM070ZTW

Touch Screen	
Type	Analog resistive, 4 wire technology
Activation force	15 g (Standard) With R8 HS60 silicon rubber
Durability	No damages or malfunctions after 3 million keystrokes as the following: Keystroke element: R8, HS40 silicon rubber Keystroke load: 150 g Keystroke frequency: 3 Hz

Display	
Size (diagonal) in cm (inch)	17.78 (7)
Type	TFT (color)
Resolution (pixels)	800 x 480
Colors	262144
Reading angle (vertical / horizontal)	130° / 140°
Half-life backlighting	40,000 h
Brightness in cd/m^2	350
Display area (H x W) in mm (Inch)	91.4 x 152.4 (3.598 x 6.0)

Environmental Conditions	
Temperature during operation	0 °C to 55 °C (- 32 °F to 131 °F)
Temperature during storage, transport	- 25 °C to + 70 °C (- 13 °F to 158 °F)
Relative air humidity for operation and storage	20 % to 85 %, no condensation
Application area	Degree of pollution 2, overvoltage category III No direct solar radiation

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Power consumption (typical at 24 V)	0.7 A

Electrical Data (Forts.)	
Connected load	16.8 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	165 x 203 x 5 (6.496 x 7.992 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	157 x 195 (6.181 x 7.677)
Mounting depth in mm (standard / field bus)	About 87 (3.425) / 105 (4.133)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 1100 g

6.5 TPEM121ZGM

Touch Screen	
Type	Low Reflective GFG (glass film glass), analog resistive, 4 wire technology
Activation force	Input area A (area within 20 mm, circulating): Minimum / maximum: 0,3 N / 1,5 N Average: 0,9 N Input area B (marginal area of 20 mm, circulating): Minimum / maximum: 0,5 N / 2,5 N Average: 1,2 N With R8 silicon rubber
Durability	No damages or malfunctions after 10 million keystrokes as the following: Keystroke element: R8 silicon rubber Keystroke load: 250 g Keystroke frequency: 2 Hz

Display	
Size (diagonal) in cm (inch)	30.73 (12.1)
Type	TFT (color)
Resolution (pixels)	1280 x 800
Colors	262144
Reading angle (vertical / horizontal)	176° / 176°
Half-life backlighting	50,000 h
Brightness in cd/m^2	320
Display area (H x W) in mm (Inch)	163.2 x 261.12 (6.425 x 10.28)

Environmental Conditions	
Temperature during operation	- 20 °C to + 60 °C (- 4 °F to 140 °F)
Temperature during storage, transport	- 30 °C to + 70 °C (- 22 °F to 158 °F)
Relative air humidity for operation and storage	Front: 5 % to 95 % Rear: 20 % to 85 %, no condensation
Operating altitude (above-sea level)	0 m to 4000 m
Application area	Degree of pollution 2, overvoltage category III

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Power consumption (typical at 24 V)	0.9 A
Connected load	21.6 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	252 x 336 x 5 (9.921 x 13.228 x 0.196)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	226 x 310 (8.897 x 12.204)
Mounting depth in mm (Inch) - (standard / field bus)	About 82 (3.228) / 100 (3.937)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 2300 g

6.6 TPM121ZGM

Touch Screen	
Type	Low Reflective GFG (glass film glass), analog resistive, 4 wire technology
Activation force	Input area A (area within 20 mm, circulating): Minimum / maximum: 0,3 N / 1,5 N Average: 0,9 N Input area B (marginal area of 20 mm, circulating): Minimum / maximum: 0,5 N / 2,5 N Average: 1,2 N With R8 silicon rubber
Durability	No damages or malfunctions after 10 million keystrokes as the following: Keystroke element: R8 silicon rubber Keystroke load: 250 g Keystroke frequency: 2 Hz

Display	
Size (diagonal) in cm (inch)	30.73 (12.1)
Type	TFT (color)
Resolution (pixels)	1280 x 800
Colors	262144
Reading angle (vertical / horizontal)	176° / 176°
Half-life backlighting	50,000 h
Brightness in cd/m^2	320
Display area (H x W) in mm (Inch)	163.2 x 261.12 (6.425 x 10.28)

Environmental Conditions	
Temperature during operation	0 °C to 55 °C (- 32 °F to 131 °F)
Temperature during storage, transport	- 25 °C to + 70 °C (- 13 °F to 158 °F)
Relative air humidity for operation and storage	20 % to 85 %, no condensation
Application area	Degree of pollution 2, overvoltage category III No direct solar radiation

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Power consumption (typical at 24 V)	0.9 A
Connected load	21.6 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	252 x 336 x 5 (9.921 x 13.228 x 0.196)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	226 x 310 (8.897 x 12.204)
Mounting depth in mm (Inch) - (standard / field bus)	About 82 (3.228) / 100 (3.937)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 2300 g

6.7 TPM121ZTM

Touch Screen	
Type	Analog resistive, 4 wire technology
Activation force	15 g (Standard) With R8 HS60 silicon rubber
Durability	No damages or malfunctions after 3 million keystrokes as the following: Keystroke element: R8, HS40 silicon rubber Keystroke load: 150 g Keystroke frequency: 3 Hz

Display	
Size (diagonal) in cm (inch)	30.73 (12.1)
Type	TFT (color)
Resolution (pixels)	1280 x 800
Colors	262144
Reading angle (vertical / horizontal)	176° / 176°
Half-life backlighting	50,000 h
Brightness in cd/m^2	320
Display area (H x W) in mm (Inch)	163.2 x 261.12 (6.425 x 10.28)

Environmental Conditions	
Temperature during operation	0 °C to 55 °C (- 32 °F to 131 °F)
Temperature during storage, transport	- 25 °C to + 70 °C (- 13 °F to 158 °F)
Relative air humidity for operation and storage	20 % to 85 %, no condensation
Application area	Degree of pollution 2, overvoltage category III No direct solar radiation

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Power consumption (typical at 24 V)	0.9 A

Electrical Data (Forts.)	
Connected load	21.6 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	252 x 336 x 5 (9.921 x 13.228 x 0.196)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	226 x 310 (8.897 x 12.204)
Mounting depth in mm (Inch) - (standard / field bus)	About 82 (3.228) / 100 (3.937)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 2300 g

6.8 TPEM150ZGX

Touch Screen	
Type	Low Reflective GFG (glass film glass), analog resistive, 4 wire technology
Activation force	Input area A (area within 20 mm, circulating): Minimum / maximum: 0,3 N / 1,5 N Average: 0,9 N Input area B (marginal area of 20 mm, circulating): Minimum / maximum: 0,5 N / 2,5 N Average: 1,2 N With R8 silicon rubber
Durability	No damages or malfunctions after 10 million keystrokes as the following: Keystroke element: R8 silicon rubber Keystroke load: 250 g Keystroke frequency: 2 Hz

Display	
Size (diagonal) in cm (inch)	38.1 (15)
Type	TFT (color)
Resolution (pixels)	1024 x 768
Colors	262144
Reading angle (vertical / horizontal)	145° / 160°
Half-life backlighting	50,000 h
Brightness in cd/m^2	480
Display area (H x W) in mm (Inch)	228 x 304 (8.976 x 11.969)

Environmental Conditions	
Temperature during operation	- 20 °C to + 60 °C (- 4 °F to 140 °F)
Temperature during storage, transport	- 30 °C to + 70 °C (- 22 °F to 158 °F)
Relative air humidity for operation and storage	Front: 5 % to 95 % Rear: 20 % to 85 %, no condensation
Operating altitude (above-sea level)	0 m to 4000 m
Application area	Degree of pollution 2, overvoltage category III

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Power consumption (typical at 24 V)	1.0 A
Connected load	24 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	338 x 400 x 5 (13.307 x 15.748 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	312 x 373 (12.283 x 14.685)
Mounting depth in mm (standard / field bus)	About 92 (3.622) / 110 (4.33)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 3700 g

6.9 TPM150ZGX

Touch Screen	
Type	Low Reflective GFG (glass film glass), analog resistive, 4 wire technology
Activation force	Input area A (area within 20 mm, circulating): Minimum / maximum: 0,3 N / 1,5 N Average: 0,9 N Input area B (marginal area of 20 mm, circulating): Minimum / maximum: 0,5 N / 2,5 N Average: 1,2 N With R8 silicon rubber
Durability	No damages or malfunctions after 10 million keystrokes as the following: Keystroke element: R8 silicon rubber Keystroke load: 250 g Keystroke frequency: 2 Hz

Display	
Size (diagonal) in cm (inch)	38.1 (15)
Type	TFT (color)
Resolution (pixels)	1024 x 768
Colors	262144
Reading angle (vertical / horizontal)	145° / 160°
Half-life backlighting	50,000 h
Brightness in cd/m^2	480
Display area (H x W) in mm (Inch)	228 x 304 (8.976 x 11.969)

Environmental Conditions	
Temperature during operation	0 °C to 55 °C (- 32 °F to 131 °F)
Temperature during storage, transport	- 25 °C to + 70 °C (- 13 °F to 158 °F)
Relative air humidity for operation and storage	20 % to 85 %, no condensation
Application area	Degree of pollution 2, overvoltage category III No direct solar radiation

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Power consumption (typical at 24 V)	1.0 A
Connected load	24 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	338 x 400 x 5 (13.307 x 15.748 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	312 x 373 (12.283 x 14.685)
Mounting depth in mm (Inch) - (standard / field bus)	About 92 (3.622) / 110 (4.33)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 3700 g

6.10 TPM150ZTX

Touch Screen	
Type	Analog resistive, 4 wire technology
Activation force	15 g (Standard) With R8 HS60 silicon rubber
Durability	No damages or malfunctions after 3 million keystrokes as the following: Keystroke element: R8, HS40 silicon rubber Keystroke load: 150 g Keystroke frequency: 3 Hz

Display	
Size (diagonal) in cm (inch)	38.1 (15)
Type	TFT (color)
Resolution (pixels)	1024 x 768
Colors	262144
Reading angle (vertical / horizontal)	145° / 160°
Half-life backlighting	50,000 h
Brightness in cd/m^2	480
Display area (H x W) in mm (Inch)	228 x 304 (8.976 x 11.969)

Environmental Conditions	
Temperature during operation	0 °C to 55 °C (- 32 °F to 131 °F)
Temperature during storage, transport	- 25 °C to + 70 °C (- 13 °F to 158 °F)
Relative air humidity for operation and storage	20 % to 85 %, no condensation
Application area	Degree of pollution 2, overvoltage category III No direct solar radiation

Electrical Data	
Supply voltage	24 V DC (SELV / PELV in accordance with DIN EN 61131)
Residual ripple	10 % maximum
Power consumption (typical at 24 V)	1.0 A

Electrical Data (Forts.)	
Connected load	24 W
Fuse	Semiconductor fuse, self-resetting
Protection against polarity reversal	Integrated

Front Panel and Enclosure	
Enclosure	Steel sheet, galvanized
Front panel material	Aluminium, brushed, black anodized
Front panel (H x W x D) in mm (Inch)	338 x 400 x 5 (13.307 x 15.748 x 0.197)
Seal	Circumferential rubber seal on the rear
Mounting cutout (H x W) in mm (Inch)	312 x 373 (12.283 x 14.685)
Mounting depth in mm (Inch) - (standard / field bus)	About 92 (3.622) / 110 (4.33)
Degree of protection	Front: IP65 Rear: IP20
Total weight	About 3700 g

7 Ordering Data

Tabelle 7-1 Accessories

Description	Part No.
SD card 512 MB	81152.513
USB 2.0 stick 1 GB	81152.100
USB 2.0 stick 2 GB	81152.200
USB 2.0 stick 8 GB	81152.800
Battery, assembled with cable and connector (Type: CR2450)	66779.100

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